

INSTALLATION INSTRUCTIONS

FT86 FUEL PUMP HANGER

FR-S, BRZ, 86

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Document# 19-0148

WARNING: DO NOT EXPOSE WORK AREA TO ANY SPARKS OR FIRE. DO NOT SMOKE WHILE WORKING ON THE FUEL SYSTEM. CLEAN UP ALL FUEL SPILLS IMMEDIATELY. WORK IN A WELL VENTILATED AREA.

Note: It is highly recommended to drain the tank to reduce fuel spills and make installation easier and safer. Also, it is recommended to remove the front left seat for additional space. **MEASURE AND RECORD THE FUEL PRESSURE BEFORE BEGINNING INSTALLATION!**

Using a 10mm socket, remove the left side rear bench seat bolt. Lift the front while pushing down on the rear of the seat to dislodge it from the hook underneath. The fuel pump access cover is held down with black adhesive caulking. To remove, use a plastic panel tool to pry it upwards. Be careful not to dent or scratch the paint. Also, be careful to not get the messy caulk on anything in the surrounding area.

Once removed, it is recommended to clean the top of the fuel pump housing and the surrounding area. This will prevent loose dirt from falling into the gas tank.



2. To depressurize the fuel system, first squeeze the tab and unplug the gray wiring connector on top of the pump housing (shown removed, lower left). Start the engine and allow it to stall. Remove the key from the ignition. Unscrew the gas tank filler cap temporarily to relieve any residual pressure.

Disconnect the negative terminal of the battery with a 10mm socket wrench. CAUTION: Disconnecting the battery may cancel fault memories of some control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories.

To detach the OEM feed line, simply squeeze the white locks and pull the female fitting away from the male tube. Use a rag to clean up any spilled fuel. If necessary, use a flat blade to dislodge the white fuel clip from the male tube fitting. Insert the clip back into the OEM feed connector.



3. To allow extra room, the nearby rubber grommet can be removed and the OEM wiring harness can be pulled out for easier modification access later.

To remove the white fuel tank lock ring, many techs will use a hammer and flat chisel. However, it is recommended to purchase a spanner tool to avoid breaking the plastic. These are relatively inexpensive and can be found from companies like Lisle, OEMTools, Ryco (shown), etc. For the FT86, Radium successfully uses Lisle P/N: 63000.

Spin the lock counterclockwise. Note: the pump housing is slightly spring-loaded. Remove the white plastic retaining ring and large green sealing washer. Set them aside as they will be reused.



4. Before removing the OEM fuel pump housing, place an empty bucket nearby. There will be residual fuel in the gas tank and in the OEM fuel pump bucket. Slowly lift the canister straight up then tilt the fuel pump housing towards the right side to clear the level sender, as shown.

To detach the OEM crossover line, simply squeeze the yellow locks and pull the female fitting away from the male tube. If necessary, use a flat blade to dislodge the fuel clip from the male tube fitting. Insert the clip back into the OEM crossover connector.

Pull the OEM fuel pump housing out and drain into the bucket. Clean the fuel pump housing and set it onto a workbench. Note: there will be fuel in the OEM bucket.



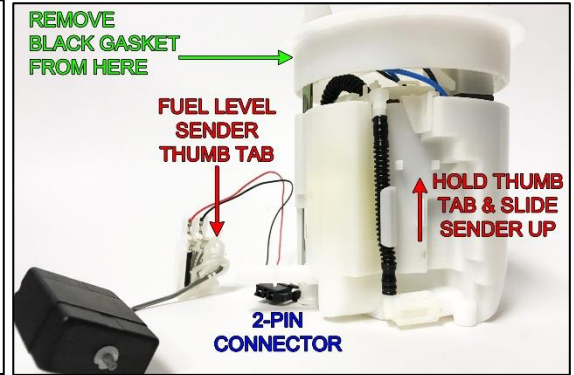
5. The only part that will be reused from the housing is the fuel level sender and the large gasket.

Depress the 2-pin wiring thumb tab from underneath the top plate and unplug the connector.

To remove the fuel level sender, press the upper right thumb tab inwards and simultaneously push the module up and out gently until it unlocks. Be careful not to damage the circuit board or bend the float arm.

Pry and pull the black OEM gasket (not shown) down off the OEM module.

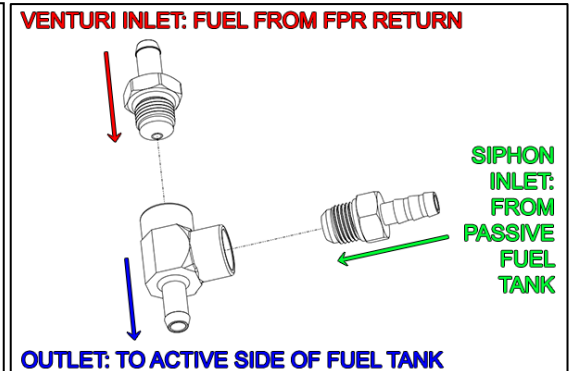
If the fuel pump hanger was purchased with pump(s) included, skip Steps 6-10.



6. If this kit was shipped from Radium after 9/1/18, this step does not apply and should be skipped. A service-free venturi jet pump was implemented that features a pressure relief valve.

If this kit was shipped from Radium prior to 9/1/18, there will be 2 different venturi jet pump orifices included. The preinstalled "green" orifice is typically best for single pump applications. The "gold" orifice is typically best for dual pump applications. The proper orifice will be determined by return line backpressure. This is dictated by many factors including: flow rate of pump(s), staged pumps, engine fuel consumption, diameter and length of return hose, etc.

The venturi jet pump O-rings MUST be lubricated prior to assembly. If installing fuel pumps, the jet pump hose assembly can stay intact unless the orifice needs to be swapped.



7. First, remove the 3 internal pump hanger bracket bolts using a 4mm Allen wrench.

To install the Walbro F90000274 (or 267) fuel pump(s), first inspect the pump outlet hose barb. If the hose barb is deformed, modified or damaged, the Radium pump adapter will not install correctly and the pump cannot be used.

Slide the black collar over the pump outlet with the flat surface upward.

Slip the stainless steel retainer between the 2 large hose barbs. When assembled, it will lodge itself under the hose barb ridge closest to the end of the pump outlet opening. **NOTE: If purchased prior to March 2020, the retainer will be C-shaped (as shown). If purchased after March 2020, the retainer will be 2-piece half circles.**

Place the included O-ring on the pump outlet, as shown.



8. Apply a high strength thread locking compound to the 3 included bolt threads. Slide the black collar upward and line up the green fitting holes to the black fitting threads. Secure and tighten all bolts evenly using a 2.5mm Allen wrench, as shown.

Lubricate the O-ring (not shown) on the male 6AN green fitting and install the fuel pump into one of the ports on the underside of the top plate using a 15mm wrench. Either of the 2 ports can be used as they share the same external outlet.



9. For single fuel pump applications, be sure the unused port on the underside of the top plate has a 6AN ORB plug fitting installed.

For dual fuel pump applications, an extra pump connector is included in the kit. Attach the wire leads from this connector to the underside of the Pump #2 power terminals using the included metal lock nuts. Connect the orange wire ring terminal to the "PWR Pump 2" stud and the gray wire ring terminal to the "GND Pump 2 stud". Extra nuts may be present in the kit and can be used as spares.

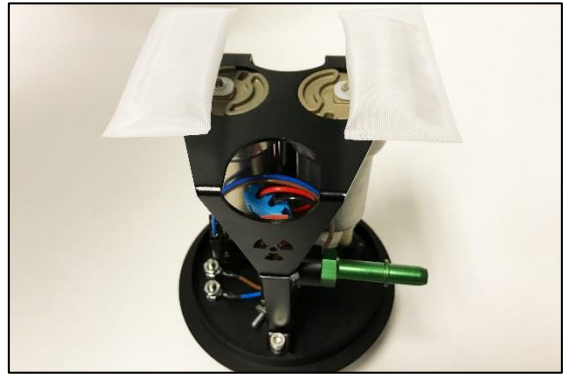
Lubricate the orange connector seal(s) and plug in the fuel pump connector(s).



10. Before reinstalling the internal pump hanger bracket, rotate and align the fuel pump(s) concentrically with the cut-outs in the internal pump bracket. Reinstall the 3 internal pump bracket bolts.

There will already be a zip tie securing the duckbill valve to the jet pump outlet barb from Radium. However, find the other “loose” zip tie included in the kit. Secure the venturi jet pump outlet barb (near the duckbill valve) to the internal pump hanger bracket, as shown.

This kit was designed to be used with a specific filter sock (**RADIUM P/N: 14-0143**). Large fuel pump filter socks which have a rigid internal “skeleton” insert may NOT form to fit inside the collector box. Press the filter sock(s) onto each pump inlet and secure with the star washer.

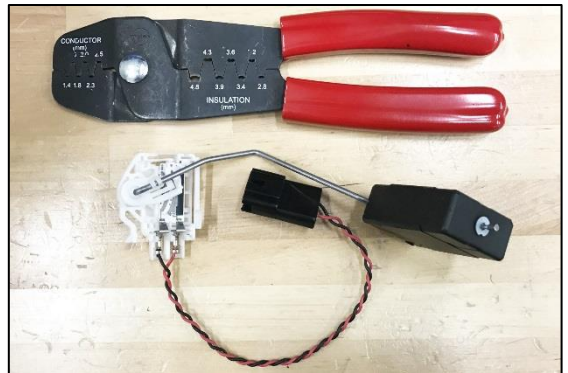


11. Locate the fuel level sender and cut the black OEM 2-pin connector off allowing as much wire slack as possible. For flexibility, twist the 2 wires together, as shown.

Strip off the insulation and crimp the 2 included terminals to each wire using a tool such as Molex 63811-1000 hand crimper (shown). Slide the terminals into the plastic connector (as shown) until a “click” is felt. It does not matter which wire goes into which slot.

Find the billet Radium fuel sender mount. Next, carefully slide the OEM fuel level sender downwards onto the billet mount until the tab locks into place.

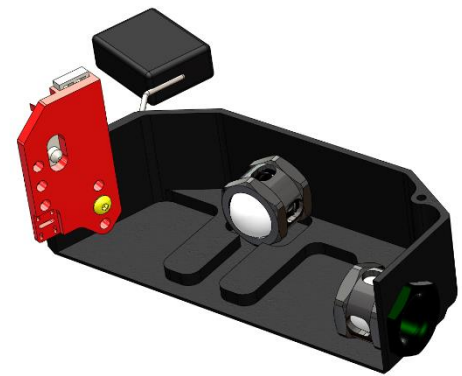
An extra electrical connector may be included in the kit and can be used as a spare.



12. Mate the fuel level sender mount (shown in red) to the collector box from the inside. **NOTE: THE FUEL LEVEL SENDER MOUNT MUST BE INSTALLED INSIDE THE BOX**, as shown. If the mount were to be installed outside the collector box, the level sender arm would interfere with the walls inside the gas tank. Install the bolt (shown in yellow) through the center hole using a 3mm Allen wrench.

Install the 2 check ball valves with the green fittings on the outside of the box, as shown.

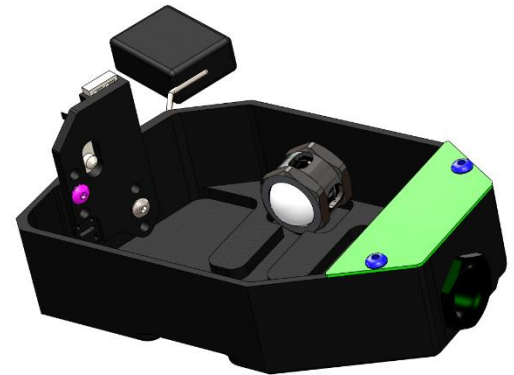
Insert both sections of the collector box into the gas tank disassembled. **Note: The collector box will not fit through the gas tank opening if assembled.**



13. Rotate the 2 pieces around inside the gas tank to easily access the 2 connection areas.

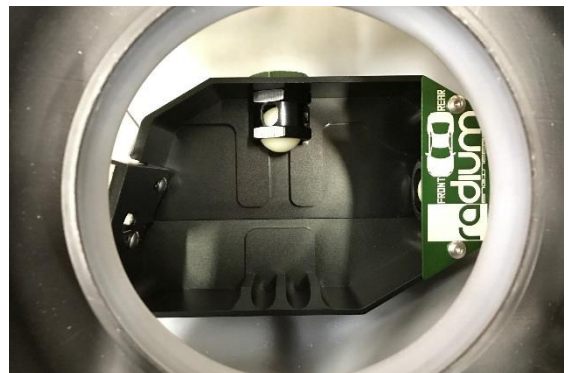
First, insert both hands into the tank and install the purple screw into the level sender bracket as shown. Next, lift the opposite end of the collector box up toward the opening of the fuel tank. This will allow easy access for installing the green baffle plate. Use the remaining two M5 screws to secure the green baffle plate in place. Last, return the collector box to the bottom of the tank.

All 3 of these M5 bolts require a 3mm Allen wrench.



14. Observe the orientation of the collector box in the picture at right. The fuel level sender should be positioned at the RH side of the gas tank. The collector box should naturally fall into place with the contours of the gas tank floor. The green baffle plate should be indicating the correct orientation with respect to the vehicle.

This is the orientation that the collector box should be sitting just before the fuel pump hanger assembly is lowered into the gas tank.



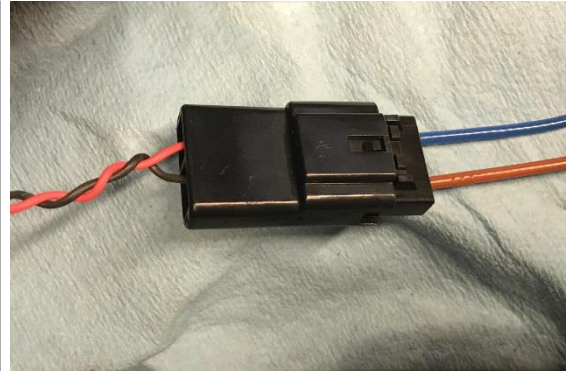
15. Find the OEM rubber gasket that was previously removed from the OEM module. Fully seat the gasket onto the fuel tank, as shown. Make sure it stays seated throughout the rest of the installation process.



16. Bring the Radium fuel pump hanger assembly close to the gas tank hole.

From the collector box, bring the fuel level sender connector up and out of the tank. Plug this into the 2-pin connector dangling from the fuel pump hanger, as shown. Position the slack of the wires so they will sit towards the front of the gas tank when lowered down.

Reach in to pull the OEM crossover hose out of the tank. Slide the OEM female SAE fitting over the jet pump SAE male fitting until a “click” is felt.



17. Carefully tip the unit to angle in the crossover hose. Next, patiently work the perimeter of the hanger lip around the black OEM gasket. Lubrication may be required for full engagement. Do not force the hanger down or you will risk the chance of damaging the gasket. Finally, drop the fuel pump hanger down vertically into the tank.

NOTE: Fortunately, because of the physical design features of the Radium unit, the positioning of the collector box will autocorrect when the fuel pump hanger is fully lowered into the tank.

Make note of the orientation graphic on the top plate of the pump hanger assembly and make sure it is aligned correctly with the vehicle, as shown.



18. The top plate and gasket should be flush with the fuel tank lid area.

Assuming the collector box was initially in the correct position, the hanger will mate with the collector box and hold it in the proper position.

When the fuel pump hanger is fully seated into the collector box, it would look like the example in this picture.



19. NOTE: It is necessary to remove the “Pump Out” fitting from the Radium top plate before proceeding.

Reinstall the green OEM sealing washer and the white OEM fuel tank lock ring.

To properly find the lock ring starting thread point, line up these 2 markers shown. When the lock ring is rotated clockwise, it will immediately engage the threads.



20. **External Wiring:** Cut off the OEM 4-pin fuel pump control module connector, as shown. Remove some of the tape, and wire loom than strip the insulation for all 4 wires about ¼" back.

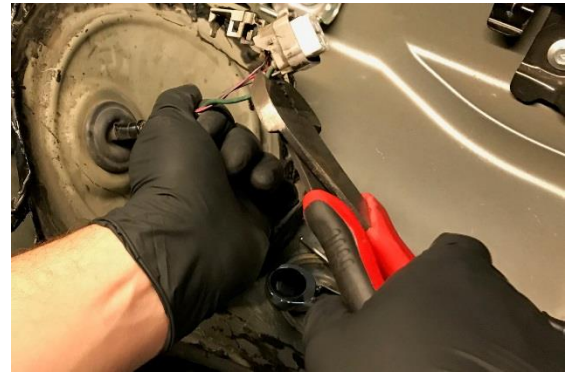
Wire Identification:

Red: Fuel Sender +

Violet: Fuel Sender -

Green: Fuel Pump +

Gray: Fuel Pump -



21. Cut two ½" pieces of the small diameter shrink tube. Insert onto each sensor wire (two small gauge wires). Next, crimp on a small gauge (AWG) ring terminal to each wire. Slide the shrink tube over the crimped section of the ring terminal and shrink into place with a heat gun. Extra parts may be present in the kit and can be used as spares.

Note: The OEM fuel pump wiring is designed for <15A. It should not be reused with aftermarket pumps at high fuel pressures. Also, it cannot be used in dual pump applications. To reuse the OEM fuel pump wiring, use the large diameter shrink tube and large gauge (AWG) ring terminals to connect the pump wires. The pump connection points on the hanger are labeled "PWR" for positive and "GND" for negative. Single pump applications only use the "Pump 1" terminals. Do not connect the ring terminals to the fuel pump hanger until the entire installation is complete.



22. **Optional high-current wiring:** For high flow, high pressure fuel pumps, consider using Radium DIY wiring kit 17-0031 (shown) for each pump. This includes a dedicated fuse, relay, 10AWG wire, etc. It is recommended to use the OEM fuel pump wiring to trigger this fused relay power source for each pump.

If using large-gauge wire for pump power, use the included larger ring terminals and associated heat shrink tubing.

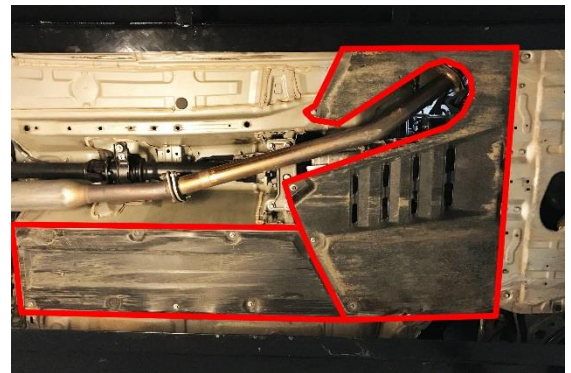
NOTE: Do not connect the ring terminals to the fuel pump hanger until the entire installation is complete.



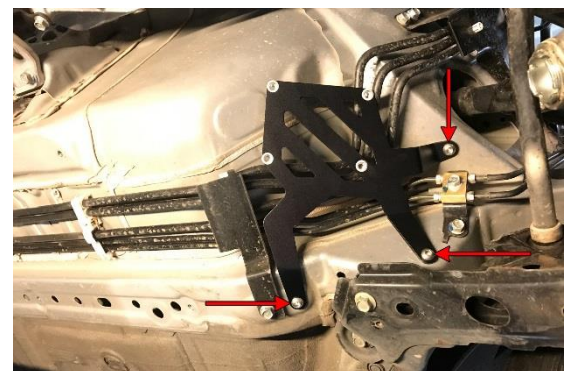
23. The fuel pump outlet uses a -8AN male adapter fitting and the return inlet uses a -6AN male adapter fitting. NOTE: The basic fuel pump hanger kit does not include fuel plumbing. A fuel pressure regulator and a low micron aftermarket fuel filter are required. **If an optional 20-0306-0X Plumbing Kit was NOT purchased, skip to the last step (34).**

Installation for (optional) 20-0306-0X Plumbing Kits:

First, safely raise the vehicle. Remove the 2 large underbody panels shown.



24. Find the mounting bracket and three M8 button head screws in the kit. Using a 5mm Allen hex wrench, secure the bracket to LH tunnel over the hard lines near the transmission.



25. Find the single O-ring and the inline 1/8" NPT adapter fitting included in the kit.

Install the O-ring to the -10AN male portion of the inline 1/8" NPT adapter fitting, as shown.



26. Apply Teflon paste to the fuel pressure gauge threads and screw it into the inline 1/8" NPT adapter fitting. Tighten finger tight, then add another 1.5 to 3 turns with a wrench.

Lubricate the inline 1/8" NPT adapter fitting O-ring with light oil and install to the fuel filter "OUTLET" port using a 1" non-marring wrench.

Lubricate the included 10AN ORB to 8AN male fitting's O-ring with light oil and install to the fuel filter "INLET" port using a 1" non-marring wrench.



27. Slide the fuel filter into the heat exchanger. Using a 4mm Allen hex wrench, secure the heat exchanger to the filter by tightening the M5 flat head screws.

For the fuel pressure regulator (FPR) fittings, install the 10AN male adapter fitting to the FPR 8AN ORB port. Install the 6AN ORB plug to the low pressure port on the opposite side of the FPR. Install the three 6AN ORB to 6AN male adapter fittings into the three remaining FPR ports. Lubricate all o-rings.

Adjoin the 2 assemblies above by securing the 10AN male and 10AN female fittings, as shown.



28. Find the 2 short (identical) 6AN PTFE hoses in the kit that have a 45 degree hose end on one side and a 90 degree hose end on the other side. Install the 45 degree hose end sides to the high pressure FPR ports.

From underneath the car, position the assembly in place and push the 2 PTFE hoses upwards towards the LH side strut of the engine bay.

Make sure the 45 degree hose ends are rotated in such a way that they run towards the sheet metal along the hard lines, as shown. This will keep them clear of the steering rod.



29. Secure the fuel filter heat exchanger section of the assembly to the mounting bracket using the four included M6 socket head bolts. Tighten using a 5mm Allen hex wrench.

If necessary, rotate the entire assembly so it is adjusted as shown. This may involve loosening and retightening of some fittings and bolts.



30. To make room near the fuel pump hanger, the rear most OEM fuel lines should be removed.

From underneath the vehicle in front of the gas tank (LH side), find the two OEM SAE fuel connections. Simply squeeze the tabs and simultaneously pull away from the hard lines. Next, pull the entire fuel Tee assembly (shown) down and out. This will NOT be reused.



31. Find the provided 3/8" fuel hose and two -6AN PushLok hose ends. Lubricate the straight hose end barbs and fully insert it into one side of the 3/8" fuel hose. Loosely route the hose between the outer front side of the gas tank and the foot well sheet metal. This may require access from the cabin and underneath the car. Route the -8AN PTFE hose in the same fashion.

From inside the cabin, install the straight -8AN hose end to the fuel pump hanger outlet port first giving it the largest bend radius possible. Next, install the straight -6AN hose end to the fuel hanger return port.

From underneath, install the 45 degree -8AN hose end to the fuel filter inlet port. Next, line up the 45 degree -6AN hose end to the low pressure FPR return port and cut the 3/8" hose to length. Using the included zip-ties, safely secure the long hoses to the existing hard lines, as shown.



32. From the engine bay, the two OEM fuel hoses attached to the high pressure fuel pump (HPFP) hard line and the port injection fuel line need to be removed.

Slide the supplied SAE release tool over the metal pipe. While inserting the small diameter side of the tool into the yellow plastic release connection, simultaneously push the fuel hose further onto the metal pipe. While squeezing together, gently pull the fuel hose off the metal pipe. Have a rag handy as fuel will drain out. This procedure should be done for both OEM fuel hoses.

NOTE: Both OEM hard lines will not be reused so they can be plugged (or removed if necessary).



33. The two -6AN fuel lines from the Radium FPR are identical and cannot be criss-crossed. They can be connected to either the HPFP line or the port injection fuel line.

If connecting the plumbing kit to OEM fuel rails, remove the green locks from the included Radium SAE fittings using a 5/64" Allen wrench. Secure the Radium SAE fittings to the 90 degree hose ends. Lightly lubricate the OEM hard lines with oil and then fully insert the included Radium SAE fittings. Line up the threaded hole and place the Radium green lock onto the Radium SAE fitting. Secure the small screw using the 5/64" Allen hex wrench.

The procedure for connecting to aftermarket fuel rails will vary. For Radium 20-0111-0X fuel rails, only one of the Radium SAE adapter fittings (mentioned above) will be required. It will attach to the HPFP metal pipe. The other hose can be connected directly to the Radium fuel rail, as shown.



34. To finalize the external wiring, insert the fuel pump and fuel level sender ring terminals onto the appropriate studs. Tighten the included acorn nuts.

Reconnect the battery and turn the key to the ON position. Confirm the new fuel pump(s) prime for a few seconds and check for leaks. If no leaks are found, start the vehicle.

The engine may run rough for a few seconds until all the air is bled from the system. Also, fuel pressure will need to be properly set (see next step). While the engine is running check for leaks. Turn the engine OFF and reinstall the OEM metal cover plate (shown) and rear seat.

Installation Complete.



35. The Radium FPR does NOT come preset to a specific pressure. To adjust, loosen the jam nut with a 3/8" wrench. Using a 3/32" Allen hex wrench, spin the set screw clockwise to increase pressure and counterclockwise to decrease fuel pressure. Use the pressure gauge as a reference.

OEM fuel pressure is ran at a constant 4Bar (58psi). To mimic OEM fuel pressure, leave the FPR barb disconnected (vent to atmosphere). To convert the fuel pressure to dynamically change with manifold pressure at a 1:1 ratio, a vacuum line (not included) must be plumbed from the Radium FPR barb to an intake manifold vacuum source.

NOTE: If necessary, the Radium fuel pressure regulator 5-bolt top cap can be clocked to point the vacuum barb fitting in 5 different directions. Use a 5/64" Allen hex wrench.



36. The Radium FPR is equipped with an interchangeable orifice that can be swapped with either of the two extra orifices included in the kit. These orifices have different inside flow diameters. This is required in order to match the pump(s) flow rate, fuel hose restrictions, and targeted base static fuel pressure.

The 0.175" silver orifice is preinstalled and is the best choice for MOST Radium Engineering fuel hanger pump configurations.

Orifice Color	Manufacturer Rated Pump Flow @ 43.5 psi
Black	One pump, up to 350 LPH
Silver	One or two pumps, up to 900 LPH total flow
Gold	Up to three pumps, 1500 LPH total flow

**These recommendations are only general suggestions to get started. Backpressure created by return line system, operating voltage and line pressure drop will have an influence on the final static pressure and orifice selection.*